

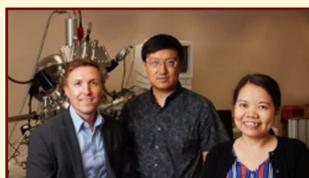
OkChE Magazine

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Chemical, Biological and Materials Engineering Faculty Roster



Jeff Harwell and Bob Shambaugh retire from OU after 40 years

Welcome to CBME from the Director, Prof. Dimitrios V. Papavassiliou

Dear Alumni and Friends,

Welcome to the CBME newsletter for Fall 2022! In the pages to follow, you will get a chance to reconnect with our School and its students, faculty and staff. You will also read about Zach Schmit, our Junior who scored a touchdown on a fake field goal attempt against Iowa State.

As the new Director, following Dr. Brian Grady's leadership for the past eight years, I want to provide a snapshot of our School just as this newsletter is published. With a student/faculty ratio of about 11, every single class in our department is taught by a faculty member, a faculty that includes two National Academy of Engineering members, three Oklahoma Higher Education Hall of Famers and five Fellows of the American Institute of Chemical Engineers, all of whom are vested in student success. All faculty are active in research and in generating new chemical engineering knowledge.

We have had a record year for publications, as well as announcements of new research grants to the tune of \$12M since July 1st 2022. Research to resolve significant socio-economic challenges through engineering innovation is thriving in CBME in areas that include energy transition and sustainability, treatment of cancer, advanced materials discovery, polymer upcycling and soft matter. Our plans for offering an on-line Masters in Sustainability for Energy and Materials Management are very close to gaining approval by the OU administration. Stay tuned for news on this front in the next newsletter! Finally, our network of alumni deeply care for the School, allowing us to offer over 40 departmental scholarships and another 15 research scholarships per year to undergraduate students.

I hope you enjoy reading this newsletter and I am looking forward to you visiting the department when you are back in town!

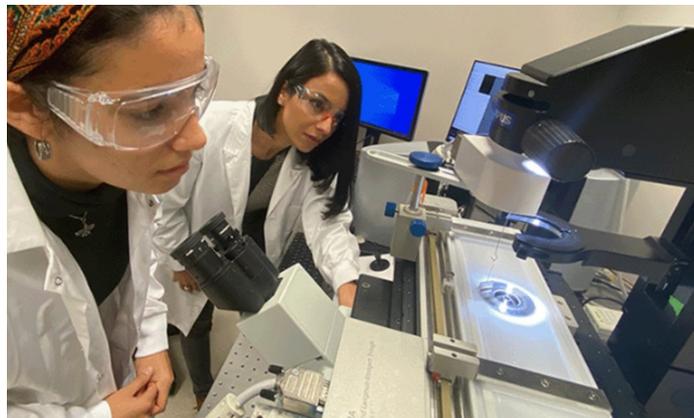


Dimitrios V. Papavassiliou, PhD
C.M. Slipecevich Professor of Chemical
Engineering
Director, School of Chemical, Biological and
Materials Engineering

Our dynamic faculty is committed to pursuing excellence in education via creative and research activities.



83 original research papers published in the last year (including journals with IF > 10)



+34% growth in research expenditures in the last year

>\$12M in external research funding since August 2022



2 NAE Affiliated



4 Early Career awards in the last 5 years from NSF and DOE



A new NSF-CAREER project (Decoding the dynamics of complex fluids near surfaces and interfaces), awarded to Dr. Sepideh Razavi, started on September 1st of 2022, which brings the number of CBME faculty who received a CAREER Award to five: Brian Grady (NSF, 1998), Steven Crossley (NSF, 2017), Bin Wang (DOE, 2020), Michele Galizia (NSF, 2021) and Sepideh Razavi (NSF, 2022).

A multidisciplinary team led by the CBME faculty Daniel Resasco, Steven Crossley, Bin Wang and Ngoc Bui, including researchers from Iowa State University, received a \$4M grant from the US National Science Foundation (NSF) for clean hydrogen research (“RII Track-2 FEC: Cost-effective Conversion of Natural Gas and Biomass to Hydrogen and Performance Carbons”).

Bin Wang, a CBME Associate Professor, received \$678k from the US Department of Energy to advance clean energy technologies and low-carbon manufacturing. The project, Computational Design of Heterogeneous Catalysts for Coupling carbon dioxide and Ethylene to Manufacture Acrylic Acid Derivatives, will lay the foundation of how carbon dioxide could be combined with ethylene, the most common industrial chemical, to make acrylic acid.

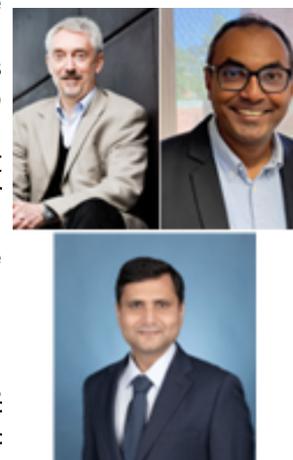
John Klier, Dean of the Gallogly College of Engineering and AT&T Chair Professor, and Brian Grady, the Douglas and Hilda Bourne Chair Professor, are part of a team led by the Oklahoma Aerospace and Defense Innovation Institute at the University of Oklahoma to develop a chromium-free organic primer for aerospace applications. They will receive \$550k for this project.

The Soft Matter Research & Technology (SMaRT) Group, led by Prof. Reza Foudazi, was granted two US Patents! Separation

columns for per- and polyfluoroalkyl substances (PFAS) remediation (US 11,447,401B1), and Antimicrobial filtration membranes (US11433359B1). Well done, Prof. Foudazi!

U.S. Department of Commerce Invests \$35 Million, through the Build Back Better Regional Challenge (BBBRC) Program, to expand biotechnology industry in the Oklahoma City area. The 21 BBBRC awardees in the US were selected from a pool of 529 applicants from all over the Country. In this framework, a multidisciplinary group of scientists from the OU and Industry, including CBME faculty members John Klier, Dimitrios Pappavassiliou, Vassilios Sikavitsas and Michele Galizia, received \$7M to build up a state-of-the-art biopharmaceutical manufacturing process laboratory.

New faculty members joined the Department in the Fall semester of 2022. Horst Hahn, who will coordinate several materials-oriented research teams across the campus, in an effort to build a world-class material science enterprise at OU. Dr. Hahn is a member of the US National Academy of Engineering, the German National Academy of Sciences called “Leopoldina”, the European Academy of Sciences, the National Academy of Inventors and a Fellow of the Materials Research Society.



Dr. Kasun Gunasooriya joined CBME as an Assistant Professor to work on computational-driven design of next generation catalysts. Dr. Gunasooriya comes from the Catalysis Theory Center, Technical University of Denmark, where he worked with Prof. Jens Nor-skov.

In January of 2023, Dr. Vivek Bajpai, who is completing his post-doctoral training at the Stanford Stem Cell Institute, Stanford University, will join CBME to work on stem cell biology, functional genomics and regenerative medicine. Welcome to CBME, Kasun, Vivek and Horst!



After 40 years of service, Prof. Jeff Harwell, an internationally recognized leader in interfacial sciences and surfactants, and Prof. Bob Shambaugh, a pioneer in polymer processing, retired from OU. Thank you, Jeff and Bob, for the great services rendered to CBME!



CBME students receive highly competitive national awards. Graduate student Lucas Condes (Michele Galizia Group) received the NSF-GRPF. Graduate student Elton Correia Lima (Sepideh Razavi Group) received the AESF (American Education Scholarship Fund) Scholarship. Undergraduate student Anahita Ervin (Sepideh Razavi Group, currently a graduate student at Duke University) received the Goldwater Scholarship.





CBME Professor and Director, **Dimitrios Papavassiliou** works on distributed manufacturing of mRNA vaccines, decarbonization of energy production and storage, nanomaterials for photothermal cancer treatment and interfacial science. His research group utilizes computational methods to probe molecular interactions responsible for macroscopically observed phenomena. Recent findings on the behavior of protein molecules as they travel through cardiovascular implants were published in PLOS ONE and in Scientific Reports. In 2022, his research on interfacial science led to publications in the Journal of Physical Chemistry B, Langmuir and Journal of Colloid and Interface Science. His research is supported mainly by NSF. Dimitrios is an AIChE Fellow and, from 2013 through 2016, was the NSF-Fluid Dynamics Program Director.



Dr. Bajpai will officially start his assistant professorship in Chemical Engineering at CBME in the Spring of 2023. His research employs diverse approaches such as stem cell modeling, genome engineering, systems biology and engineering principles to investigate fundamental biological processes with the aim to engineer novel interventions for human health and environmental applications. Vivek has published 14 peer-reviewed research articles with an average impact factor of 12.7. Other than being supported by startup funds from the University of Oklahoma, Vivek's laboratory is supported by a grant from the Oklahoma Center for Adult Stem Cell Research.



Ngoc Bui is an assistant professor of Chemical Engineering and is affiliated with Environmental Science Department. Her research interests lie at the interface of advanced functional materials, molecular transport, and energy-efficient separation processes for sustainable water, energy and environment. Before joining OU in August 2020, she was a postdoc fellow at the Molecular Foundry at Lawrence Berkeley National Laboratory, where she led efforts in developing self-assembled supramolecular materials for water remediation via low-temperature thermal-based, adsorption-based, and membrane-based separations. Prior to LBNL, she was a postdoc fellow at Lawrence Livermore National Laboratory, where she and her team demonstrated prototypes of wafer-scale carbon nanotube membranes for smart dynamic fabric materials. Recent research efforts focus on the design and understanding of advanced adsorbent and membrane materials for resource recovery published in Nature Communications and Science in 2020 and 2021, respectively.



Steven Crossley, Sam A. Wilson Professor and Teigen Presidential Professor, is a full professor of Chemical Engineering. His research is in the area of catalysis and nanomaterials synthesis, with the particular emphasis on understanding catalytic reactions in complex and dynamic environments. Dr. Crossley is a NSF CAREER recipient and leader of an NSF EFRI focused on developing new catalytic strategies for recycling of mixed plastics waste, as well as large NSF and DOE funded grants focused on the catalytic conversion of natural gas and waste biomass to hydrogen and carbon nanotubes. His research has been published in many prestigious journals including Science, Science Advances, Nature Catalysis, Nature Communications, JACS, Energy and Environmental Science, among others. He served as the CATL division Programming Chair for the 2019 and 2020 ACS fall national meetings and currently serves as member-at-large of the division. He also serves as current president for the Great Plains Catalysis Society. He serves as a faculty fellow for the Institute of Resilient Environmental and Energy Systems (IREES). Dr. Crossley works to facilitate the success of Native American students in STEM fields and serves as faculty advisor for the University of Oklahoma's award-winning American Indian Science and Engineering (AISES) chapter.



Dr. Reza Foudazi is a CBME associate professor. His research is focused on porous polymers, self-assembly, complex fluids, and colloid and interface science. Before joining OU in 2021, he was a tenured associate professor at New Mexico State University (NMSU). Dr. Foudazi has received funding from different agencies such as the National Science Foundation, ACS Petroleum Research Fund (ACS PRF), Bureau of Reclamation, U.S. Environmental Protection Agency (EPA), and the New Mexico Water Resources Research Institute. Dr. Foudazi has authored more than 65 publications in peer-reviewed journals and is inventor of 7 intellectual properties on topics such as producing porous polymers, membranes for filtration, and Per- and Polyfluoroalkyl Substances (PFAS) remediation. Among his most recent publications, Two-Step Thermo-responsive Ultrafiltration Membranes from Polymerization of Lyotropic Liquid Crystals, which appeared in ACS Appl. Polym. Mater. in October of 2022. Dr. Foudazi is Co-founder and CSO of Filtravate, a membrane technology company for applications in the bioprocessing and biopharmaceutical industries. He received the Early Career Award from NMSU Research Council in 2016, Polymer Processing Society Early Career Award in 2019, ACS PMSE Young Investigator Award in 2020, and NMSU Intellectual Property Award in 2021.



Jie Gao is an Assistant Professor of Practice in Chemical Engineering. She is a certified Project Management Professional (PMP)[®]. She currently teaches undergraduate ChE laboratory courses. She led an effort to develop a hybrid lab course, whose outcomes are reported in the journal of Chemical Engineering Education. Her research interests focus on functionalizing and manufacturing advanced materials for energy and water applications.



A CBME Assistant Professor, **Michele Galizia** has received a number of awards, including the NSF CAREER Award in 2021, the 2021 Class of Influential Researchers by I&EC Research (ACS), the ACS-PRF New Doctoral Investigator, and the OU Chemical Engineering Outstanding Professor Award in 2021 and 2022. His research, which is currently supported by a few NSF grants, lies in the broad area of polymer science, with special emphasis on the design, synthesis characterization and modeling of polymer membranes exhibiting enhanced selectivity and long-term stability against plasticization and physical aging. Among his most recent publications, "The mechanism of light gas transport through configurational free volume in glassy polymers" was selected as the Editors' Choice in the Journal of Membrane Science issue of June 2022. He is co-author of about 60 publications, and serves the Journal of Polymer Engineering as an Associate Editor and the Journal of Membrane Science as a member of the Early Career Editorial Board.



Brian Grady, the Douglas and Hilda Bourne Chair in Chemical Engineering, is a technical fellow of the Society of Plastics Engineers and a Fellow of the American Institute of Chemical Engineers. An NSF CAREER awardee in 1998, Dr. Grady is also Director of the Institute for Applied Surfactant Research at the University of Oklahoma. He currently has research funded by the Air Force, National Science Foundation and the Department of Energy. He works on biodegradable polyesters, carbon nanotubes in polymers and surfactant adsorption and applications for cleaning. Publications in 2022 include a study to improve cold water detergency published in Journal of Surfactants and Detergents and a review of self-healable polymers published in Macromolecular Rapid Communications.



G. T. Kasun Kalhara Gunasooriya, member of AIChE, ACS, RSC, and NACS, is an assistant professor of Chemical Engineering. His research focuses on developing innovative strategies to produce renewable energy, fuels and chemicals by the computational design of efficient thermo- and electro-catalytic processes. To achieve this, he combines his expertise in the fields of computational catalysis, kinetic modeling, and machine learning, with a special focus on underpinning structure-property relationships of advanced catalytic materials to accelerate materials discovery and establish catalyst design principles. He has published in Nature Reviews Methods Primers, Nature Catalysis, Nature Communications, Energy & Environmental Science, ACS Energy Letters, ACS Nano, ACS Catalysis, and Current Opinion in Chemical Engineering.



Dean of the Gallogly College of Engineering, **John Klier**, is a AT&T Chair in Chemical Engineering. Prof. Klier, a member of the National Academy of Engineering, received his PhD in Chemical Engineering at Purdue under the supervision of Prof. Nicholas Peppas, and immediately started a career in Dow Chemicals, where he led R&D efforts in several countries of the world. After returning to Academia in 2015, he led/is leading research efforts in several directions, including bio-based renewable and recyclable plastics, high performance thermoset coatings and bio-manufacturing. His work was recently published in ACS Sustainable Chem. Eng. and ACS Applied Mater. & Interfaces.



Lance Lobban is the Francis W. Winn Chair in Chemical Engineering and David Ross Boyd Professor. His research during his 35+ years at OU has been in the areas of reaction engineering and catalysis with application to energy, alternate fuels and sustainability. His present major research focus concerns polymer recycling, in particular upcycling of multilayer polymer films in a project sponsored by the National Science Foundation. Work in this area has been submitted for publication to Applied Catalysis: B (Environmental) and ACS Catalysis.



Matthias Ulli Nollert, Associate Professor of Chemical Engineering, works in the area of biomedical engineering. His research seeks to understand the role of fluid mechanics in modulating the biology of blood cells and the cells of the blood vessel wall. He is part of a cross-disciplinary team of OU faculty that was awarded a grant from the Howard Hughes Medical Institute for a proposal titled “Meaningful evaluation of effective and inclusive teaching through changes in policy, effective instructor development, and optimal sources of evidence.” This grant is part of a larger effort involving OU and 15 other institutions around the country that are looking for ways to make STEM teaching more inclusive.



Sepideh Razavi started her independent career as an Assistant Professor of Chemical Engineering at University of Oklahoma (OU) in 2018 and is a recipient of the ACS-PRF Doctoral New Investigator award (2020) and the NSF CAREER award (2022-2027). The Razavi Lab employs colloidal particle synthesis and modification, interfacial rheology techniques, and microscopy tools to study the behavior of complex fluids near surfaces and interfaces, which can be leveraged in the developing of sustainable soft materials and engineering of solutions to complex interfaces often encountered in wicked problems concerning “water and energy sustainability.” Her work has resulted in 18 peer-reviewed publications, including 8 papers prior to starting my independent career, in highly ranked journals such as JACS, ACS Applied Materials & Interfaces, and Journal of Colloid & Interface Science.



Edgar O'Rear, a fellow of AIChE and AIMBE, is a full professor of Chemical Engineering. He is a founding member of the Institute for Applied Surfactant Research (IASR) and of the Institute for Biomedical Engineering, Science and Technology (IBEST). His research is in the areas of biomedical engineering and surfactants with focuses on trauma to blood during mechanical circulatory support and admicellar polymerization. Recent publications appear in *Journal of Artificial Organs*, *Cells* and *Journal of Industrial and Engineering Chemistry*. His research is/has been supported by NSF, NIH and OCAST.



Daniel Resasco is a member of the Oklahoma Hall of Fame of Higher Education, AIChE and NAI fellow, professor of Chemical Engineering and GLC professor. He holds the Gallogly Chair of Engineering and is senior editor of *Catalysis Reviews*. He has recently received several important awards, including the Exceptional Achievements in Catalysis from the American Chemical Society, the Great Plains Catalysis Society Award (OK, KS, MO, NE), the R.B. Anderson Catalysis Award from the Chemical Institute of Canada, the Excellence in Catalysis Award from the Catalysis Society of Metropolitan New York, and the ExxonMobil Lectureship from the University of Massachusetts. In 2022, he published his work in top catalysis journals that include *ACS Catalysis*, *Journal of Catalysis*, *JACS Eng Au*, *Molecular Catalysis*, *Catalysis Science & Technology*, and *Journal of Physical Chemistry*. His work focuses on the design and synthesis of novel catalysts that take advantage of the unique role of liquid water at the liquid/solid interfaces; he uses experimental kinetic measurements combined with spectroscopic characterization and theoretical modeling to study reactions of relevance in the sustainable production of fuels and chemicals. This work is supported by NSF, DOE and Phillips 66.



Vassilios Sikavitsas is a full professor of Chemical Engineering. His research areas include Musculoskeletal Tissue Engineering, Tissue Engineering Bioreactors, Adult Stem Cell Differentiation, Bone Cell Mechanotransduction, Biomaterials / Biomimetics, In Vitro Cancer Models and Cancer Exosome Interactions with the Immune System.



Alberto Striolo, Fellow of IChemE, RSC, IoP, IOM3, is the Asahi Glass Chair of Chemical Engineering within CBME. His research employs an arsenal of computing techniques, ranging from atomistic to coarse-grained models, to study interfacial systems. His research motto is: 'Rerum Cognoscere Causas': his group seeks to discover the molecular-level phenomena responsible for macroscopic observations, so that large scale processes can be improved to address grand societal challenges such as energy and materials sustainability. In recent publications (e.g., *ACS Applied Materials and Interfaces* 13 (2021) 40002), structure-function relations were described for surfactants used to control the formation of gas hydrates. His group is also developing tools to quantify the environmental impact of new and existing processes, for example geothermal energy production (e.g., *Cleaner Environmental Systems* 6 (2022) 100086). Funding for his research is obtained by a variety of sources, including Federal Agencies and industry.



Bin Wang is an associate professor of Chemical Engineering. His research is on computational molecular and materials engineering, with particular emphasis on heterogeneous catalysis and batteries. In 2022, relevant results were published in *ACS Catalysis*, *Journal of Catalysis*, and many others. His research is supported by NSF and DOE. Bin Wang received the DOE Career Award in 2020.

Latest news from CHEGS, the CBME Graduate Students Association



Alongside busy research schedules, graduate students are challenged to integrate opportunities for social and professional development. These challenges were recently intensified by the pandemic lockdowns, where many researchers became socially isolated. Such isolation adversely affected student organizations, whose activities were halted or dissipated. In September of 2021, the OU Chemical Engineering Graduate Society (ChEGS) was re-established with a new cohort of officers, with international student Gabriela Faria as president and under faculty advisor Dr. Reza Foudazi.

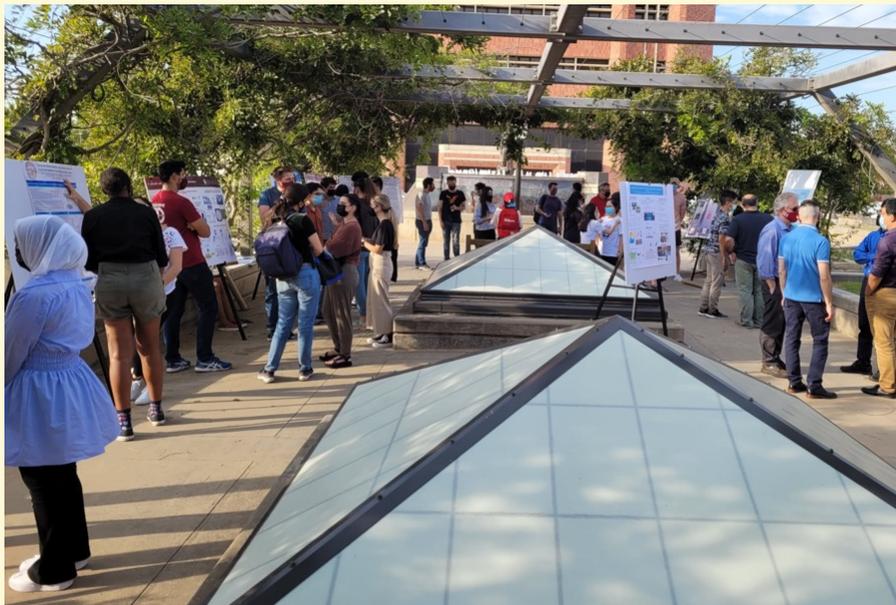
Firstly, ChEGS wants to provide opportunities for graduate students, post-doctoral researchers and faculty to socialize and connect with each other. Since its revival, ChEGS has hosted biweekly Coffee Chats for professors and students to exchange ideas and meet each other in more casual settings. ChEGS has also focused on welcoming our new graduate students: we hosted a Q&A zoom meeting for incoming students, held before their arrival, with current graduate students. This event allowed them learn about housing, commuting and classes. When these new students arrived in August, ChEGS hosted a barbecue and pool party to kick off the semester.

Also, ChEGS has focused on seeking and sharing advice from our faculty members and extended network. We have been hosting seminar series and panel discussions featuring professors from our department, who

have given workshops on resume writing, scientific presentations and writing, personal finance, academic careers, entrepreneurship and more. These have had a great reception not only by graduate students and postdocs, but several undergraduate students attended these workshops as well, gaining insights into the research activities and opportunities within our department. We invited a speaker from outside the department, such as Dr. Raj Krishnaswamy, Vice President of Polymers R&D at CJ Biomaterials, who gave a talk about industrial R&D and biodegradable polymers. This fall, before the 2022 AIChE National Meeting in Phoenix, ChEGS also began hosting conference practice talks for students. These are voluntary opportunities for graduate students to present their conference talks in front of an audience and get sincere feedback while also allowing students to become familiar with their colleagues' research portfolios. We believe our efforts will make CBME a more welcoming place for students and post-doctoral researchers, while improving our education and professional development.

While ChEGS has been applying for funding from campus sources, we are also looking for dedicated sponsors to help expand our activities. If you are interested in giving a talk or providing support, please feel free to reach out to our faculty advisor, **Dr. Reza Foudazi** (rfoudazi@ou.edu).

Latest News from our AIChE local student chapter



On October 6th of 2022, the local AIChE students chapter organized the fifth edition of the CBME research night. This event, which was launched in 2018 when Prof. Michele Galizia became the chapter's advisor, is intended to showcase research and creative activities in our department to the general public of undergraduate students, their parents, faculty and alumni. Many undergraduate students got involved in research after this event.



Meet **Zach Schmit**, a Chemical Engineering Junior and starting kicker for the OU football team

During the Iowa State game in October 2022, Zach scored a touchdown, the first by an Oklahoma kicker since 2013. A native of Oklahoma City, Zach wants to attend graduate schools and, after completing his PhD, continue on to law school. "OU has a feeling of family, especially in the Chemical Engineering department. It makes me proud to be part of such a prestigious and well-known program! CBME faculty members truly care about students' success. I'm hoping one day I can launch my own law firm as a patent lawyer, helping engineers patent their inventions!" Zach says.

Other than being an athlete, Zach takes good care of his studies in Chemical Engineering. Congratulations, Zach!



Alexander Jablonski, a CBME alumnus (BS in Chemical Engineering, class of 2019), was the top scorer on the July bar exam, after graduating from the School of law of Texas A&M in May of 2022. Alex works for Munck Wilson Mandala in Dallas, specializing in litigation.



Meet **Mrs. Madena McGinnis**, the CBME Undergraduate Program Coordinator. No doubt, Madena is one of our department pillars. A few generations of students, since 2007, have benefitted from her support for enrollment and advising. Madena, thank you for passionately supporting our program and for playing a pivotal role in helping CBME achieve its mission.



Nate Richbourg, a native of Oklahoma and CBME Alumnus, successfully defended his PhD at UT Austin under Prof. Nicholas Peppas, working on hydrogels for drug delivery. Before going to UT, Nate was an undergraduate student in the Sikavitsas Lab at CBME. Congratulations Dr. Richbourg, we are proud of you!



CBME faculty, students and staff wish Colleagues, Alumni and Friends happy holidays!